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Health-promoting Lifestyle and Predicting Anxiety Caused by COVID-19 In Medical Sciences Students

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Abstract:

Objectives: In recent years, the COVID-19 pandemic has altered the daily lives of people around the globe and caused significant mortalities and public health issues. The objective of the current study was to determine the role of health-promoting behaviors in predicting anxiety caused by COVID-19 in Shahroud University of Medical Sciences students in 2022.

Methods: This cross-sectional study included 350 students from various medical sciences who were chosen through a multi-stage stratified random sampling process. We gathered the necessary information by administering health-promoting lifestyle and COVID-19-related anxiety questionnaires. This inventory has 18 items and is scored on a 4-point Likert scale. The range score is between 0 and 54. The data were analyzed by ANOVA, Chi-square, and Pearson's correlation coefficient. All tests have a significance level of 0.05.

Results: Based on lifestyle questionnaire scores, 51 students (15%) had a poor lifestyle, 272 (79.8%) had an average lifestyle, and 18 (5.3%) had a good lifestyle. Anxiety averaged 6.20±6.18, and health-promoting lifestyle averaged 123.64±19.05. Health-promoting lifestyle did not correlate with COVID-19 anxiety. Stress management, nutrition, and physical activity scored the lowest. Academic semester (p=0.03), family income (p=0.006), and marital status (p=0.03) were associated with COVID-19 anxiety.

Conclusion: Students had low COVID-19 anxiety and average health-promoting lifestyles. Despite initial concerns, the data showed no significant association between COVID-19 anxiety and the students' vaccination status. However, it's worth noting that vaccination has the potential to reduce anxiety among students. Stress management, nutrition, and physical activity can improve student lifestyles.

Keywords: Health-promoting lifestyle, Stress management, Nutrition and physical activities, Interpersonal relationships, Health responsibility, Spiritual growth, Medical students.

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1. INTRODUCTION

The occurrence of the pandemic and the spread of COVID-19 have resulted in increased unemployment, isolation, death, and deterioration of people's lives [1]. Based on the latest WHO report, until 16 November 2023, globally 773 million confirmed cases and 6980000 deaths were occurred. In Iran, the cumulative number of confirmed cases and deaths that were reported are equal to 7623000 and 146000, respectively. In Iran, the total doses administered per 100 population equal to 185.07 and the persons vaccinated with a complete primary series per 100 population was 69.7 [2]. On 5 May 2023, WHO stated that COVID-19 is now established and is not a public health emergency of international concern. [Rapid global spread and high mortality rate in the first year of pandemic have caused widespread anxiety across populations [3, 4]. Following the COVID-19 pandemic, a multicenter survey involving 1563 medical staff showed almost 73.4% experienced traumatic stress, 50.7% experienced depression, 44.7% experienced general anxiety, and 36.1% experienced insomnia [5]. These findings are important for more attention to mental health problems.

Since the start of the COVID-19 pandemic, many people have clinically experienced a tendency toward fear and anxiety [6]. Anxiety can be defined as a collection of symptoms caused by an imperfect human adaptation to life's stresses and strains. Among these symptoms is fear of a bad accident, fear of losing control, fear of dying, instability, inability to relax, shortness of breath, heart palpitations, excessive sweating, hot flushes, numbness or tingling of the limbs, restlessness in the legs, dizziness or lightheadedness, shivering, trembling of the hands, and indigestion. Meanwhile, one of the most common symptoms of anxiety disorders is fear of a bad accident or being infected with COVID-19 [7, 8]. Anxiety about COVID-19 is common, and it seems to be mostly due to its unknown nature, which creates cognitive ambiguity about the virus and its treatment [9]. This anxiety and fear can weaken the body's immune system and make it vulnerable to diseases like COVID-19 [10].

Encouragement of health-promoting behaviors and lifestyle changes is one of the most effective ways to reduce and deal with the anxiety caused by COVID-19. Lifestyle changes are the main way to prevent many diseases and improve health [11, 12]. According to research, healthy behaviors, particularly physical activity and stress management, are helpful for reducing anxiety [13]. As previously stated, there is a strong link between a person's health and his healthy lifestyle [14]. According to a WHO study, lifestyle and social support play an important role in health [15]. A health-promoting lifestyle includes behaviors that empower people to gain more control over their health and, as a result, improve the health of the individual and society [16-18]. This way of lifestyle consists of six dimensions: stress management, nutrition, physical activity, interpersonal relationships, health responsibility, and spiritual growth [19-23], and these behaviors can predict stress and anxiety [13].

Students generally fail to maintain a healthy lifestyle, putting them at risk of anxiety and age-related diseases [24]. The experience of attending university is a critical stage in life because of the interaction with peers and their greater independence from the family environment. It is between school and work. However, students frequently lead unhealthy lifestyles, increasing their risk of negative health outcomes [25]. Some studies show that students' lifestyles lack physical activity and health responsibilities [26]. Iranian studies found that medical students lead unhealthy lifestyles [23, 27, 28]. In our previous studies in Shahroud in two different universities (public and private] the majority of students had a moderate level of healthy lifestyle [23, 28]. The occurrence of the COVID-19 pandemic and its impacts on educational program in universities, including virtual training, can affect on students life lifestyles. A Chinese study shows that students have a healthy lifestyle [17]. According to the findings of an Iranian study, healthy behaviors explain 62% of the total variance in COVID-19 anxiety, and compliance with healthy behaviors is associated with low COVID-19 anxiety [29-35].

The COVID-19 pandemic is causing rapid and unprecedented changes in daily life. The number of casualties at various peaks is changing, and the measures required to contain and control the spread of this disease have increased in various parts of the world. COVID-19-related anxiety is common, and countermeasures to treat it are widely available. Few studies have examined COVID-19 anxiety predictors in at-risk individuals, particularly students. The current study aimed to investigate the role of health-promoting behaviors in predicting anxiety caused by COVID-19 in students of Shahroud University of Medical Sciences because of the topic's significance, the novelty of the disease, and the reopening of universities in 2022.

2. MATERIALS AND METHODS

This cross-sectional study included 350 medical students selected using multi-stage stratified random sampling in 2022. First, the proportion of the overall population of each faculty was computed based on the number of students in each faculty; then, the list of active classes of each faculty, including majors and semesters, and the number of students in each major, were determined. In the Shahroud University of Medical Sciences in 2022, a total of 2311 students were studying in four faculties. In the next step, classes were randomly selected as clusters according to the required number of samples and the average number of students in each class and all eligible studying students in classes were recruited. Students who had recently defended their thesis (graduated) and guest students (students that temporally studying at another university) were excluded from the classes list.

In this study, we utilized health-promoting lifestyle and COVID-19 anxiety questionnaires, which included demographic questions regarding age, gender, the field of study, level of education, academic semester, marital

status, the native or non-native status of the student, current residence of the student, economic status of the family, economic activity while education, parents' residence, the number of family members, and the father's occupation.

Health-promoting lifestyle questionnaire [36, 37] consists of 52 questions covering six areas, including nutrition (7 items), physical activity (8 items), health responsibility (13 items), stress management (5 items), interpersonal relationships (8 items), and spiritual growth (11 items) on a 4-point Likert scale: never (score 1), sometimes (score 2), often (score 3) and always and usually (score 4), so that high scores indicate a health-promoting lifestyle. The final numerical score was between 52 and 208. The scores of each subgroup were divided into 3 classes. In each subgroup and the whole questionnaire, if participants scored equally and less than 50%, they were in poor condition. Obtaining a score between 50 and 75% is an average condition, and a score equal to and above 75% indicates a good condition of a health-promoting lifestyle. The Persian version of the questionnaire has been validated using Cronbach's alpha coefficient equal to 0.82 [23, 28, 36].

The COVID-19 anxiety questionnaire was developed and validated to measure the anxiety caused by the spread of the coronavirus in Iran. The final version of this tool has 18 items covering 2 areas. Items 1-9 measure psychological symptoms, and 10-18 measure physical symptoms. This tool is scored on a 4-point Likert scale (never = 0, sometimes = 1, often = 2, and always = 3). Therefore, the respondents' highest and lowest scores are between 0 and 54. High scores in this questionnaire indicate a higher level of anxiety in individuals. Alipour *et al*. [9] assessed the reliability of this tool using Cronbach's alpha coefficients of 0.879 for the psychological component, 0.861 for the physical dimension, and 0.919 for the entire questionnaire in Iran.

After explaining the study's objectives to the students, trained interviewers distributed and collected the questionnaires in this investigation. This study has been approved by the Ethics Council of Shahroud University of Medical Sciences under the code of ethics IR.SHMU.REC.1401.110. In order to maintain the anonymity of the participants, no names or initials were required to complete the questionnaires. Also, subjects were free to participate in the study. The data were imported into SPSS 16 and analyzed using ANOVA, Chi-square, and Pearson correlation tests. Structural equations were used to investigate the relationship between hidden and observable variables. The significance level in all tests was 0.05.

3. RESULTS

The survey received 341 responses out of 350, with a response rate of 97.4%. Women made up 70.1% of the population (n=241). There were also 227 undergraduate students (66.6%) and 114 medical and graduate students (34.4%). There were 318 single students (93.3%), and the rest were married. With 299 (87.7%), non-native students were the most common. The dormitory housed a total of 323 students (94.7%). Only 68 (19.9%) students worked in addition to their studies. Both parents of 322 individuals were still alive (94.4%). In the study, 266 students (78%) had contracted COVID-19, and 301 (88.3%) had family members who had contracted COVID-19. The findings revealed that 95 students (27.9%) had a history of close relatives or family members passing away because of COVID-19. The parents of 165 students (48.4%) worked for non-government organizations, while the families of 269 (78.9%) earned more than 300 $ monthly. Only 7 students (2.1%) did not receive vaccinations, while 306 (89.7%) received all 3. The students' average age was 21.9±2.8 years, their average anxiety score was low (6.2±6.2), and their average health-promoting lifestyle was moderate (123.6±19.0). The highest scores were for stress management, nutrition, physical activity, interpersonal relationships, health responsibility, and spiritual growth. The overall average score was moderate (Table **1**).

Table 1. Mean and standard deviation of anxiety and health promoting lifestyle and subscales in medical students.

Variables	Mean±SD	Minimum	Maximum
Anxiety caused by COVID-19	6.2 ± 6.2	0	54
Psychological symptoms	5.4 ± 4.3	0	27
Physical symptoms	0.8 ± 2.7	0	27
Health-promoting lifestyle	123.6 ± 19.0	74	187
Spiritual growth	29.6 ± 5.8	14	44
Health responsibility	28.9 ± 6.5	14	52
Interpersonal relationships	21.4 ± 4.0	10	32
Physical activity	16.3 ± 5.3	8	30
Nutrition	15.8 ± 3.4	7	27
Stress management	11.6 ± 2.6	5	20

Table 2. Relationship between demographic with COVID-19 related anxiety.

Variables	Anxiety caused by COVID-19, N (%)			X^{2*}	p value
	None 36 (10.6)	Low 291 (85.3)	Moderate and High 14 (4.1)	-	-
Faculty	-	-	-	-	-
Public health	10 (13.7)	59 (80.8)	4 (5.5)	Fisher	0.66
Para-medicine	10 (8.0)	109 (87.2)	6 (4.8)		
Medicine	10 (10.2)	86 (87.8)	2 (2.0)		
Nursing and midwifery	6 (13.3)	37 (82.2)	2 (4.4)		
Marital status	-	-	-	-	-
Single	33 (10.4)	275 (86.5)	10 (3.1)	Fisher	0.009
Married	3 (13.0)	16 (69.6)	4 (17.4)		
Economic activity during education		-	-	-	-
Yes	10 (14.7)	57 (83.8)	1 (1.5)	2.84	0.24
No	26 (9.5)	234 (85.7)	13 (4.8)		
Location	-	-	-	-	-
Urban	33 (10.6)	266 (85.3)	13 (4.2)	Fisher	1.0
Rural	3 (10.3)	25 (86.2)	1 (3.4)		
History of COVID-19 infection		-	-	-	-
Yes	26 (9.8)	229 (86.1)	11 (4.1)	0.79	0.67
No	10 (13.3)	62 (82.7)	3 (4.0)		
History of COVID-19 infection in family		-	-	-	-
Yes	29 (9.6)	261 (86.7)	11 (3.7)	3.91	0.14
No	7 (17.5)	30 (75)	3 (7.5)		
Death related to COVID-19 in family		-	-	-	-
Yes	9 (9.5)	81 (85.3)	5 (5.3)	0.58	0.75
No	27 (11)	210 (85.4)	9 (3.7)		
Vaccination	-	-	-	-	-
No	2 (28.6)	5 (71.4)	0 (0)	Fisher	0.45
One dose	2 (18.2)	9 (81.8)	0 (0)		
2 doses	9 (8.3)	93 (86.1)	6 (5.6)		
3 doses	19 (10.2)	162 (86.6)	6 (3.2)		
4 doses	4 (14.3)	22 (78.6)	2 (7.1)		
Current residency	-	-	-	-	-
Dormitory	34 (10.5)	276 (85.4)	13 (4)	Fisher	0.74
Personal	2 (11.1)	15 (83.3)	1 (5.6)		
Father job	-	-	-	-	-
Non official	21 (12.7)	136 (82.4)	8 (4.8)	2.17	0.34
Governmental	15 (8.5)	155 (88.1)	6 (3.4)		
Income (monthly)	-	-	-	-	-
More than 300 $	21 (7.8)	236 (87.7)	12 (4.5)	10.38	0.006
Less than 300 $	15 (20.8)	55 (76.4)	2 (2.8)		
Parent	-	-	-	-	-
Both are live	32 (9.9)	277 (86.0)	13 (4.0)	Fisher	0.16
One of them is deceased	4 (21.1)	14 (73.7)	1 (5.3)		
Semester	-	-	-	-	-
1-4	15 (9.9)	126 (82.9)	11 (7.2)	6.86	0.03
>5	21 (11.1)	165 (87.3)	3 (1.6)		
Sex	-	-	-	-	-
Male	11 (11.0)	85 (85.0)	4 (4.0)	0.032	0.98
Female	25 (10.4)	206 (85.5)	10 (4.1)		

Note: Fisher exact test was done when over than 20% of the expected number is less than 5.

The classification of health-promoting lifestyle scores showed that 51 students (15%) have a poor lifestyle, 272 (79.8%) have an average lifestyle, and 18 (5.3%) have a good lifestyle.

Table **2** shows that whereas 291 (85.3%) of the students had low COVID-19 anxiety, 12 (3.5%) had moderate anxiety, and 2 (0.6%) had severe anxiety. There was no association between COVID-19 anxiety and the

student's vaccination status, current residence, the father's occupation, or the living conditions of the parents, regardless of the type of college attended, whether or not the student had a job outside of school, whether or not any family members had contracted COVID-19, or whether or not any family members had died from COVID-19. Students' COVID-19 anxiety was significantly associated with the semester they were enrolled in, their families' financial level, and whether or not they were married. Furthermore, COVID-19 anxiety was highest among students in semesters 1-4 and their monthly income was over 300$ per month.

Table **3** demonstrates a substantial association between the location of the student's parents and the health-promoting lifestyle. There was also no correlation between health-promoting lifestyle scores and COVID-19 anxiety scores using the Pearson correlation coefficient (r-0.004, p value=0.94).

Table 3. Relationship between demographic and COVID-19 related anxiety with health promoting life styles.

Variables	Health Promoting Life Styles, N (%)			X^{2*}	P-value
	Weak	Moderate	Good		
Faculty	-	-	-	-	-
Public health	7 (9.6)	60 (82.2)	6 (8.2)	7.21	0.30
Para-medicine	20 (16)	97 (77.6)	8 (6.4)		
Medicine	16 (16.3)	81 (82.7)	1 (1.0)		
Nursing and midwifery	8 (17.8)	34 (75.6)	3 (6.7)		
Marital status	-	-	-	-	-
Single	50 (15.7)	252 (79.2)	16 (5.0)	Fisher	0.25
Married	1 (4.3)	20 (87)	2 (8.7)		
Economic activity along with education		-	-	-	-
Yes	12 (17.6)	52 (76.5)	4 (5.9)	0.59	0.75
No	39 (14.3)	220 (80.6)	14 (5.1)		
Parent residency	-	-	-	-	-
Urban	48 (15.4)	251 (80.4)	13 (4.2)	Fisher	0.03
Rural	3 (10.3)	21 (72.4)	5 (17.2)		
History of COVID-19 infection		-	-	-	-
Yes	38 (14.3)	214 (80.5)	14 (5.3)	0.44	0.80
No	13 (17.3)	58 (77.3)	4 (5.3)		
History of COVID-19 infection in family		-	-	-	-
Yes	46 (15.3)	239 (79.4)	16 (5.3)	0.23	0.89
No	5 (12.5)	33 (82.5)	2 (5.0)		
Death related to COVID-19 in family		-	-	-	-
Yes	15 (15.8)	77 (81.1)	3 (3.2)	1.21	0.55
No	36 (14.6)	195 (79.3)	15 (6.1)		
Vaccination	-	-	-	-	-
No	0 (0)	6 (85.7)	1 (14.3)	Fisher	0.23
One dose	1 (9.1)	10 (90.9)	0 (0)		
2 doses	20 (18.5)	84 (77.8)	4 (3.7)		
3 doses	23 (12.3)	151 (80.7)	13 (7)		
4 doses	7 (25)	21 (75)	0 (0)		
Student’s current residency	-	-	-	-	-
Dormitory	48 (14.9)	257 (79.6)	18 (5.6)	Fisher	0.81
Out of dormitory	3 (16.7)	15 (83.3)	0 (0)		
Father job	-	-	-	-	-
Non-governmental	21 (12.7)	133 (80.6)	11 (6.7)	2.26	0.32
Governmental	30 (17.0)	139 (79.0)	7 (4.0)		
Economic status of the family		-	-	-	-
Over 300 $	40 (14.9)	216 (80.3)	13 (4.8)	0.53	0.77
Less than 300 $	11 (15.3)	56 (77.8)	5 (6.9)		
Parent		-	-	-	-
Both are live	47 (14.6)	258 (80.1)	17 (5.3)	Fisher	0.63
One of them is deceased	4 (21.1)	14 (73.7)	1 (5.3)		
Semester	-	-	-	-	-

(Table 3) contd.....

Variables	Health Promoting Life Styles, N (%)			X^{2*}	P-value
	Weak	Moderate	Good		
1-4	18 (11.8)	125 (82.2)	9 (5.9)	2.20	0.33
≤5	33 (17.5)	147 (77.8)	9 (4.8)		
Sex	-	-	-	-	-
Male	17 (17.0)	80 (80.0)	3 (3.0)	1.79	0.41
Female	34 (14.1)	192 (79.7)	15 (6.2)		
Locality	-	-	-	-	-
Local	7 (16.7)	32 (76.2)	3 (7.1)	0.49	0.78
Non-local	44 (14.7)	240 (80.3)	15 (5)		
Anxiety Caused by COVID-19		-	-	-	-
None	7 (19.4)	26 (72.2)	3 (8.3)	Fisher	0.43
Low	41 (14.1)	236 (81.1)	14 (4.8)		
Moderate and high	3 (21.4)	10 (71.4)	1 (7.1)		

Note: Fisher exact test was done when over than 20% of the expected number is less than 5.

4. DISCUSSION

The average score of anxiety caused by COVID-19 was 6.2 ± 6.2, which was low. Similar to the present study, another study conducted in Ecuadorian universities using the DASS-21 questionnaire found that the average anxiety level was 5.53±4.99 [3]. A 2020 study in China found that the average anxiety of students was 15.5, which was higher than the results of our study. In this study, Zung Self-rating anxiety scale with 20 items was used [38]. One of the reasons for the greater anxiety score in Chinese students could be the use of different questionnaires and the timing of the study in the early months of the COVID-19 outbreak. In another study in Iran with a similar questionnaire to our study, the average score of anxiety caused by COVID-19 was reported as 14.31±10.13, which is higher than the present results [39]. This study was done immediately after the first wave of COVID-19 in Iran and at this time, there were restrictions and lockdown regulations. The universities were closed and, training was online and community sensitivity to COVID-19 was higher and no vaccination was conducted.

The findings showed that 10.6% of students had no anxiety caused by the spread of the coronavirus, 85.3% had low anxiety, 3.5% had moderate anxiety, and 0.6% had high level of anxiety. In a systematic review conducted in China between 2018 and 2020, the percentage of COVID-19 anxiety in students ranged between 8.54 and 88.30, with an average percentage of 27.2, which is higher than the current study's average [40]. In a study in a South American country (Ecuador), students' anxiety level was found to be higher than the cut-off point, which is inconsistent with our study however, they used DASS-21 as a measurement tool [3]. Another study on students studying in Egypt and Germany found that students had an average state anxiety score higher than the cut-off point. However, the questionnaire that was used in the study was different from the one used with us [4]. The studies in China indicate a high level of anxiety in students, and the prevalence of anxiety in students has been reported to be between 15.5 and 26.6%. Chi and et.al used an online version of the Zung Self-Rating Anxiety Scale (Z-SAS) inventory with 20 items and in another one, the Generalized Anxiety Disorder 7 (GAD-7) was used for assessing anxiety [38, 41]. A study in Palestine showed that 23.4% of students did not experience COVID-19 anxiety, 25.5% had low and moderate anxiety, and 21.3% had high anxiety, which is higher than the results of the present study. in the Palestinian study a general Beck anxiety inventory was used to assess the presence of anxiety symptoms [42]. In a study in Turkey, students experienced the highest level of anxiety about the continued spread of COVID-19 and the transmission of the coronavirus to another person. They used the Beck Anxiety Inventory (BAI) with 21 items to assess the severity of anxiety [43]. In a systematic review, the estimated prevalence of anxiety was reported to be 28%, which is higher than the results of the present study [44]. Using different questionnaires and conducting the study in the first months of the COVID-19 outbreak and different cultures, the government's handling and decision-making in the pandemic administration [45], are perhaps among the reasons for the different results.

There was no statistically significant association between gender and COVID-19 anxiety categorization, contrary to what was found in an Ecuadorian study (higher fear and anxiety in women) [3] but consistent with the findings of a Palestinian study [42]. In a study conducted in Morocco [46], China and Vietnam [47, 48], there was a significant relationship between gender and anxiety caused by COVID-19, which is not consistent with the results of the present study [46]. The first study was conducted on Moroccan high school students and on the primary stages of epidemic in 2020. In the study of Vietnamian medical students, anxiety was prevalent among students with a higher score of fear of COVID-19. Both anxiety and fear of COVID-19 were prevalent in females [47]. Female's additional caretaking duties during the pandemic and higher perception of threat can make them more vulnerable to anxiety [49, 50].

There was no association between having a job during education, parents' residence, and the student's current residence and anxiety caused by COVID-19. In a study conducted in Palestine, a significant relationship was found between age, parents' place of residence, and the student's current residence and anxiety caused by

COVID-19; however, our findings [42] do not support this finding. The reopening of universities, mass vaccination and induced herd immunity, and the decline in the fatality of new strains prevalent in the country during the study year may all contribute to a reduction in student anxiety. The data showed no significant association between COVID-19 anxiety and the students' vaccination status. In our study, the vaccination coverage was more than 98 percent which is far from the community coverage.

A significant relationship was found between academic semesters, family income, marital status, and COVID-19-induced anxiety. In China, a significant relationship was found between academic semesters and COVID-19-induced anxiety, which is consistent with the findings of this investigation [47]. In the study of Turkey' medical students, there was not a significant differences when the first three-year students were compared with the last three-year students [43]. In relation to academic level and anxiety, the findings show a lack of consistency. In a study conducted among college students in China, senior students had a higher risk of developing anxiety during the pandemic compared to juniors [51]. In Palestine, a significant relationship was found between academic semesters and family income and COVID-19-induced anxiety, consistent with our findings [42]. The COVID-19 pandemic led to severe financial hardship, such as unemployment and this can be influenced by student families that faced. In our study, the prevalence of anxiety was higher in higher economic groups. This finding must be inferred carefully because we did a univariate analysis.

According to the data, 15% of the students led a poor lifestyle, 79.8% led an average lifestyle, and 5.3% led a good lifestyle. The pupils' average health-promoting lifestyle score was 123.6 ± 19.0. A study in Saudi Arabia using the same questionnaire that we used found that students' average health-promoting lifestyle score was 123.8 ± 19.8, which is comparable to the current study's findings [52]. A study in China indicated the status of a healthy health-promoting lifestyle, which contradicts our findings. In this study, they used a modified Chinese version of HPLP-II adapted for collage context, which included 25 items [17]. Other research at Iranian institutions of medical sciences has revealed that the status of students' healthy lifestyles is modest, which is consistent with our findings [23, 53, 54]. A comparison between our previous study and the present study did not show any significant change in the level of health-promoting scores before and after COVID-19 pandemic [23, 28]. The variations and similarities in scores (with similar measurement tools) appear to result from differences and similarities in the cultural and social settings of the investigated environments. During the COVID-19 pandemic especially in the primary stages, many of persons shifted to a healthier lifestyle to improve their immunity. Changes to a healthier lifestyle were observed in 19.3% of the adult population in the Netherlands [55].

The lowest lifestyle ratings were connected to stress management, nutrition, physical activity, and interpersonal connections, while health responsibility and spiritual growth scored higher. The results revealed that the average lifestyle score in all aspects was normal. A study in China showed that the lowest scores were connected to physical activity, nutrition, and stress management. Our study [17] found that these three categories are the least-ranked healthy lifestyle characteristics. Physical exercise, health responsibility, and stress management received the lowest scores in a survey in Saudi Arabia, which is relatively comparable to the results of the current study, except for the dimension of health responsibility [52]. Interpersonal relationships and physical activities had the lowest ratings in a study at Kermanshah University of Medical Sciences, which is similar to our findings only in the component of physical activity [54]. Another study conducted in Shahroud in 2017 found that the lowest score was associated with physical activity, stress management, and nutrition, comparable with the current findings except for the order of dimensions [23]. One of the common features of the research is the low score of physical activities, nutrition, and stress management according to the lifestyle of students in academic contexts. Their promotion can assist in improving the circumstances.

The average score for health responsibility was 28.9±6.5. In a study in Saudi Arabia, the average score for this dimension was 17.9±4.5, which was lower than our finding [52]. The previous study in Shahroud found that the average score for this dimension was 34.0, which is in the range of the confidence limit of our study [23]. Furthermore, in the present study, the average interpersonal relationships score was 21.4±4.0. A study conducted in Saudi Arabia found that the average score for this dimension was 23.4±4.4, which is in the range of the confidence interval of our study [52]. Another research in Iran found that the average score for this dimension was 21.6±3.9, which matches the prior study [23]. The average score for spiritual growth was 29.6±5.8, whereas the average score for this dimension in Saudi Arabia was 25.5±4.9, which point estimate is lower than the current study but it is in the range of the confidence limit of our estimate [52]. The previous study in Shahroud found that the average score for this dimension was 27.4±5.24, similar to the current study [23].

The average physical activity score in our study was 16.3±5.3. The scores obtained in the two previously mentioned studies on Saudi Arabia [52] and Shahroud [23] were 16.7±5.3 and 14.1±4.9, similar to the current study. In addition, the average nutrition score was 15.8±3.4, which was similar to Saudi Arabia and Shahroud studies (21.3±3.9 and 18.6±4.1, respectively) [23, 52]. The average stress management score in the current study was 11.6±2.6, while the average score in a study in Saudi Arabia was 18.9±3.7, which was higher than the findings of this study [52]. The average score for this dimension was 11.73±2.64 for the previous study in Shahroud, which is in the range our current study estimates [23].

There was no significant association between health-promoting lifestyle and the factors of gender, age, kind of

college, economic activity in addition to education, parents' residency, student's present residence, academic semester, monthly family income, and married status. Saudi Arabia's research found no significant link between age, academic term, family income, gender, and health-promoting lifestyle, which is consistent with the current study's findings [52]. He observed a strong association between health-promoting lifestyle and gender in a South Korean study, which contradicts the findings of our study. However, no association was found between academic semesters and lifestyle, consistent with our findings [20]. A study at a medical university in Iran found a strong association between the status of health-promoting lifestyle and gender, age, marital status, and semester of study, which is similar to our findings [53]. Another study in Iran found that age and type of college had no significant relationship with a health-promoting lifestyle, which is consistent with our findings. However, there was a significant relationship between gender, students' current residence, marital status, monthly family income, and health-promoting lifestyle, contradicting our findings [54]. The result of our previous study in Shahroud before the COVID-19 pandemic found an association between age, gender, education level, the student's parent's residence, economic status, and health-promoting lifestyle, which is comparable with the current study's results except for the student's parents' residency [23]. The variations and similarities in scores seem to result from differences and similarities in the cultural and social settings of the investigated environments.

There was no significant and favorable relationship between health-promoting lifestyle ratings and COVID-19-induced anxiety. Other research at Iranian medical universities found an inverse link between a healthy lifestyle and anxiety generated by COVID-19, which contradicts our findings [39, 53]. One reason for the disparity in results might be that this study was conducted in 2022, two years after the coronavirus epidemic alert in Iran, and the universities were reopened and some of them left their families and settled in the dormitory.

5. LIMITATIONS OF THE STUDY

There will be a reverse causality error due to the study's cross-sectional nature and the lack of studies prior to the outbreak of COVID-19 studying the causative association between health-promoting lifestyle and anxiety caused by COVID-19. Because the study was restricted to one university, the extrapolation of the study's conclusions to the entire society is limited. The study's merits include its strong design, coverage of all students from various departments of medical sciences, acceptable sample size, and use of standard questionnaires. Furthermore, expanding this cross-sectional investigation to a longitudinal study will aid in determining the evolutionary route of COVID-19 psychological impacts and predictors during the COVID-19 epidemic.

CONCLUSION

COVID-19 anxiety among students was low, and their health-promoting lifestyle was average. Conducting the study in 2022 after mass vaccination, reducing the mortality of COVID-19, opening the universities and decreasing the sensitivity of the community to COVID-19 can be among the factors influencing anxiety. Despite initial concerns, the data showed no significant association between COVID-19 anxiety and the students' vaccination status. However, it's worth noting that vaccination has the potential to reduce anxiety among students. The good prognosis of COVID-19 in younger men and the normalization of conditions related to the epidemic were among the other reasons. Intervention techniques in stress management, nutrition, and physical activity can assist students in improving their lifestyles.

AUTHORS' CONTRIBUTIONS

Conceptualization: M.A, A.Kh; Data curation: Z.M, E.S; Formal analysis: A.Kh, M.A; Funding acquisition: M.A; Methodology: M.A, A.Kh; Project administration: M.A, Z.M, E.S; Supervision: M.A; Writing–original draft: M.A, E.S; Writing–review & editing: all authors.

ABBREVIATION

COVID-19 = Coronavirus disease of 2019

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Ethical Review Board of Shahroud University of Medical Sciences with the code IR.SHMU.REC. 1401.110.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

The oral informed consent was used for this study.

STANDARD OF REPORTING

STROBE guidelines were followed in this study.

AVAILABILITY OF DATA AND MATERIALS

All data generated or analysed during this study are included in this published article. For other data, these may be requested through the corresponding author [A.K].

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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